Designing Easy-to-Use Online Documentation Systems

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Many products and services now include online documentation, which is rapidly gaining acceptance among users. To compete successfully with paper documentation, online documentation systems must be designed to be as easy to use as traditional paper documents. To develop this ease of use, designers of online documentation must draw upon user interface design principles and established techniques for effective technical writing. This paper describes some advantages of online document systems, several factors that influence their usability, and recent developments in online documentation within AT&T. It also presents some examples of AT&T online documentation products.

Introduction

High-quality customer documentation contributes significantly to a product's usability and perceived quality, and is an integral part of AT&T's products and services. Often, documentation is the first thing that customers see and use. They may form distinct perceptions of the usability of a system or software based on the documentation. If the document is easy to use, many will assume that the system will be easy to use as well.[1] At the third annual AT&T Customer Documentation Symposium, Robert M. Kavner, recently named Executive Vice President of AT&T and Chief Executive Officer of the Multimedia Products and Services Group, noted that: "The quality of documentation will affect how we are viewed by our customers.... If the documentation is unclear, error-prone, or sketchy, the customer's perception of value and quality will diminish."[2]

Advantages of Online Documentation. As products become more complex and the volume of documentation multiplies, the value of high-quality documentation also increases. The typical system programmer requires 45 feet of shelf space for documentation, navy warships carry 10 to 25 tons of documentation,[3] and the set of 5ESS® switch documentation includes approximately 35 different reference manuals. Faced with complex products and large volumes of information, customers are demanding a better approach.

In many ways, online documentation can satisfy the documentation needs of customers of AT&T products and services, as well as provide benefits to suppliers of documentation. It can offer easy ways to access, manage, and store information, and can lower documentation costs.

From a user's perspective, online documents are a more efficient, convenient way to handle the ever-increasing volume of documentation accompanying products and services. Users prefer a single compact disk read-only memory (CD-ROM), rather than a set of 30 paper documents. The power and speed of a computer give users quick access to the information provided by online documents. Performing an electronic search of a 1000-page online document is much more efficient than performing a manual search of a comparable paper document. Compared to paper documents, online documents also offer users more ways to search, using methods such as context-sensitive strategies, Boolean searches (which we will discuss later), and searches based on approximate spellings.

Documentation suppliers also reap the benefits of online documentation because, typically, it costs less to produce.[4,5] Assume that you need to deliver 5000 copies of a

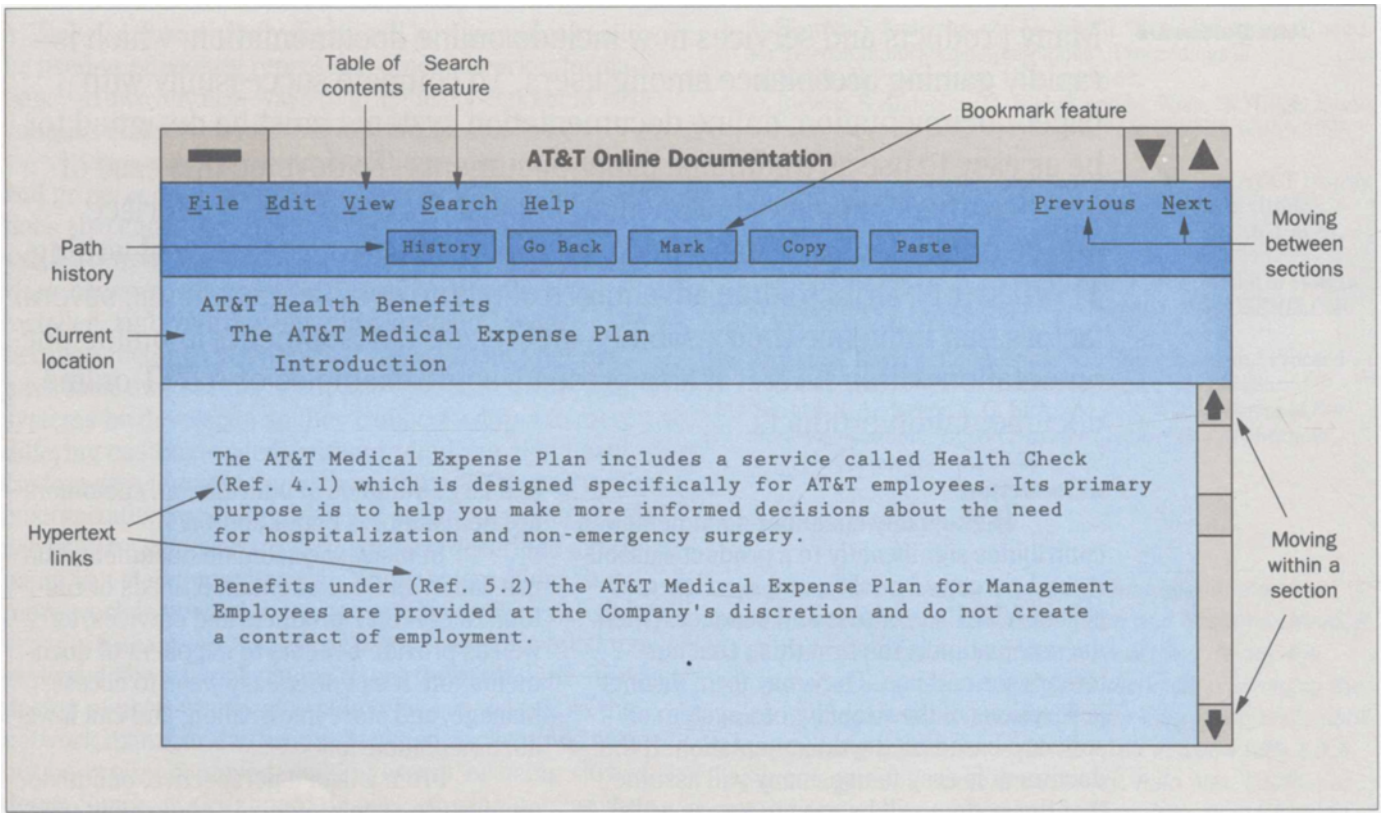

Figure 1. A sample AT&T of online documentation that shows functions and features commonly found on these systems.

1000-page document. This delivery contains 5 million pages of documentation (1000 pages × 5000 copies), which at $0.01 per page would cost $50,000. By comparison, a single CD-ROM can easily hold 1000 pages, and 5000 copies of a single CD-ROM might cost $15,000, assuming a cost of $3 per CD-ROM.

Suppliers also observe that online documents are easier to update and distribute than paper documents. Immediately after a new version of a document is installed on a central computer, users on a data communications network can access or download the newest version. This feature can be especially valuable for sales catalogs, price lists, organizational charts, or any other information source that changes frequently.[6]

Factors Affecting Ease of Use

Although online documentation systems are attractive for many reasons and can enhance the overall quality of a product or service, these systems must be designed with an understanding of what makes them easy to use. Two factors can significantly affect their ease of use:

- Designing features that incorporate user interface principles to help users find information, browse, and read online documents easily
- Creating text displays whose content and format make them easy to read.

Users of paper documents know how to find information within a document, where the table of contents and index are located, how to mark a section for later reference, and how to find a cross reference. For an online system to be judged easy to use, it must compete with the long history that users have with paper documents and their perceived ease of use. Users of online documents must be able to find the table of contents, initiate an electronic search, browse through text, and locate topics of interest — all with the same ease that a paper document offers.

Content and format issues also contribute to

Table I. Procedures for Accessing Tables of Contents

	Online Documentation System			
Procedure	**IDS**	**G3MA**	**IDS Windows**	**Frame Relay**
Step 1	Press OUTLINE	Press GO TO	Press VIEW	Press TOPICS
Result	Table of Contents is displayed	Submenu is displayed	Submenu is displayed	Table of Contents is displayed
Step 2		User chooses either Table of Contents or Index*	User chooses either TOC Summary or TOC Complete*	
Result		Table of Contents is displayed	Table of Contents is displayed	

*Display as options on a menu.

how easy an online system is to use. The screen size of a computer display is typically smaller than paper and lacks its resolution. Factors such as whether the content and format are effective for a screen display, whether the type size is appropriate, and whether the format is conducive to quick scanning are among the design considerations that will determine whether an online document is easy to use.

Access Features

Designers of online documentation must provide users with features that shorten and simplify the task of finding information in online documents. It is challenging because users can only view documents one screen at a time. This restriction can be very disorienting, much like reading a newspaper through a paper towel tube.[4] To overcome this problem, online documents typically offer a variety of access tools that enable users to locate information or browse through documents:

- Tables of contents — A list of topics included in the online document. This is especially valuable to new users of online systems.[7]
- Electronic searches — The user types a term(s) and the online software locates topics associated with that term. Electronic searches can be conducted in many ways, depending on the degree of input required from the user.
- History functions — The online software tracks topics and screens viewed by each user and enables him or her to review them.
- Hypertext links — Computerized links enable users to move rapidly from one related topic to another.

The sections that follow identify some usability issues that relate to these access tools. Figure 1 presents an AT&T online system that includes many of these features.

Tables of Contents. Users of paper documents frequently rely on the the table of contents to find information. It also identifies major topics and provides a high-level overview of a document's content. Equally important in online documents, a table of contents is included in many AT&T online documentation products. Tables of contents in online documents do not differ significantly from those found in paper documents. They typically include chapter titles and, sometimes, subheading titles, although they rarely list page numbers. An online table of contents functions like a menu in a software application. Users need only highlight a title in the table of contents to display its associated text.

An important difference between paper and online documents is how the table of contents is accessed. In paper documents, the user simply turns to the front matter of the document, whereas in an online document, the user must enter some command, press a key, or click on a button to access the table of contents. Depending on the user interface design, this may be either easy or difficult. The labels on keys or buttons may be intuitive or confusing; the user may be required to perform one step or several to achieve the desired response. Table I summarizes procedures to access a table of contents in several AT&T online documentation systems, including the AT&T Information Delivery System (IDS) for MS-DOS, the AT&T Information Delivery System for Microsoft Windows, the *G3MA Online Guide*, and the *Guide to*

Frame Relay. (Microsoft and MS-DOS are registered trademarks and Windows is a trademark of Microsoft Corporation. See Panel 1 for a brief description of each of these systems.)

Two observations from this table are noteworthy. First, the online systems included here do not have a key labeled **TABLE OF CONTENTS**, presumably because of space considerations. Instead, these systems use terms such as **OUTLINE**, **VIEW**, or **TOPICS**. To many users familiar with paper documents, these terms may not be intuitively obvious. Second, in each application presented, the user must take some steps to display the table of contents. In other online systems, the table of contents is displayed automatically. For example, DynaText, developed by Electronic Books Technologies, provides users with two windows at all times: one window that displays text and another that continuously displays the table of contents. (DynaText is a registered trademark of Electronic Books Technologies, Inc.)

Electronic Searches. Online documentation systems offer several types of searches, including:

- Keyword searches, in which a string of words (search string) entered by the user is compared with invisible keywords specified by the document's writer
- Full-text searches, in which a user-supplied word or phrase is compared with the text of the document
- Boolean searches, which provide the user with logical operators, such as AND, OR, and NOT (see the example of search strings shown in this section)
- Search by example procedures, which guide the user through the definition of a search string by providing prompts that demonstrate how the document is organized.

Two factors determine how easy search mechanisms provided by online document systems are to use: the ease with which a search string can be specified, and how often the searching operation can access the topic that best matches the user's request. Research indicates that it is difficult to use Boolean operators to initiate a search request.[8] In library systems, for example, most users initiate only simple searches because they cannot, or will not, learn to use Boolean syntax to initiate more complicated searches.

One approach that helps users initiate a search is providing examples, or templates, of legal searches. The online document *Guide to Frame Relay* uses this technique. Before entering a search string, the user sees screen text similar to what follows here. This screen text identifies both simple and complex search requests.

```
Examples of search strings:
     circuit
     virtual circuit
     virtual and circuit
     virtual or circuit
     (permanent and circuit) or
     (pvc and networks)
```

Some systems help the user specify a search string by providing an online form that can be completed. This form prompts the user for categories of information that can be used to search the document electronically. For example, prompts in a medical document might include symptom, disease, or organ; prompts in a computer manual might include hardware, command name, or file name. As soon as the form is completed, the user can initiate the search. After reviewing the results of the first search, the user can modify the search by adding or deleting information from the form, and then begin a new, refined, or selective search. This interaction can continue until the user locates the desired information.

The second factor crucial to the user's acceptance of online search procedures is the likelihood that an electronic search will locate a topic that the user wants. To improve the search process, writers should define keywords that conform to users' expectations. The online system should allow users to search:

- For nonwords, such as abbreviations, acronyms, or part numbers
- Through figures and tables, in addition to text
- With phrases, either as a unit or as individual words, without restricting the order or position of words.

The success of electronic searches also depends on writing factors, such as consistency. This factor is discussed in the section entitled "Content and Format."

History Functions. The history function can significantly improve usability by making it easy to return to previously viewed topics, especially if a user becomes disoriented in an online document. It enables a user to retrace his or her steps through the document until a familiar location is reached, which is desirable in hypertext documents. A user can explore one topic, skip to a related one, and then quickly return to the first.

Typically, the history function may be implemented either as a function key that immediately moves the user to previous locations, or as a display listing

Panel 1. A Sampling of AT&T Online Documentation Systems

AT&T Information Delivery System for MS-DOS, Release 2.1

A character-based document retrieval system that operates under MS-DOS to access large databases of information. IDS was developed by the Customer Information Development and Business Translations organization (formerly the Document Development Organization). Several versions of the character-based IDS product are available. Users can access IDS online documents on their desktops, either with a CD-ROM or through a network connection to a central server.

G3MA Online Guide

This character-based online document was developed internally by Global Business Communication Systems to support a set of system management applications for switching systems. The *G3MA Online Guide* can be viewed with an IBM-compatible personal computer and will soon be available for UNIX-based systems. (IBM is a registered trademark of International Business Machines Corporation, and UNIX is a registered trademark of UNIX System Laboratories, Inc.)

AT&T Information Delivery System (IDS Windows) for Microsoft Windows, Release 2.1

A document retrieval system that is compatible with the Microsoft Windows graphical user interface environment. It can access large databases of information. This version of IDS was also developed by the Customer Information Development and Business Translations organization.

Guide to Frame Relay

A graphical online document developed with Hyperties (a product of Cognetics Corporation) to display information stored as articles in a knowledge database. (Hyperties and Cognetics are registered trademarks of Cognetics Corporation.) Each article may contain both text and graphics and display links to other articles, all of which allow users to browse freely through hypertext paths of interest.

previously viewed topics. There are obvious tradeoffs between these two methods. Implementing the history function as a display of previously viewed topics provides quick access to topics further back in the history file. However, the function-key method provides quick access to the last topic read. Easy-to-use online systems provide clear labels or intuitive icons to distinguish the history function from the more standard reverse paging function. Several AT&T online systems include a history function, each using the function-key method, which displays previous topics. Labels used for the history function include **BACK**, **GO BACK**, and **BACK UP (PREVIOUS ARTICLE)**.

Hypertext Links. Hypertext documents are designed as a network of topics interconnected by machine-supported links. These links are typically highlighted phrases, or "hot spots," in a text display, which move the user rapidly from one part of a document to another in electronic leaps, rather than sequentially.[9]

Online documents with hypertext links give access to various types of information, according to a user's needs. Depending on the links provided, the user may read a reference, look up a definition or acronym, check a bibliographic reference, or read a contrasting viewpoint or elaboration.[4] This advantage comes at a price, however. Users of hypertext frequently become disoriented within the web of hypertext links[10,11] and experience the classic "lost in hyperspace" syndrome.[4,10] This problem occurs when users do not have sufficient information about their current location relative to the overall structure and organization of the document database.[12]

The designer can alleviate this disorientation by following some simple principles:[4,5,12]

- Keep user interface design simple and limit the number of methods that must be learned to access information.
- Limit the number of hypertext links. Screen displays should include, at most, four or five possible links.
- Provide graphic representations of the network of available links. For example, Figure 2 depicts a graphic map of hypertext links for this paper.
- Design a mechanism that makes it easy to return to the original topic.

Content and Format

Designing access strategies that exploit the power and speed of the computer and are also easy to use is not the only requirement for successful online

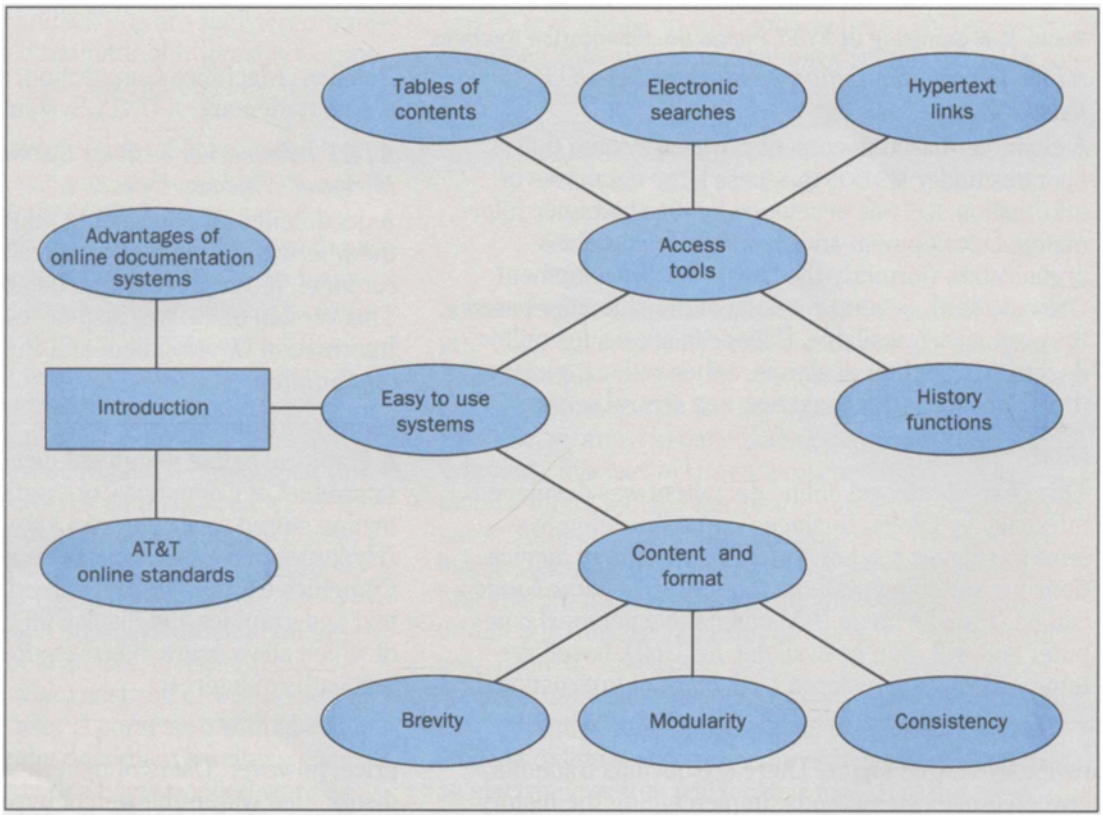

Figure 2. A graphic map of hypertext links for this paper.

documents. Another essential requirement is a writing style that is brief, consistent within itself, and modular. Borenstein demonstrated that rewriting the help text greatly improved the usefulness of online help systems.[13] Writers of online documents must recognize crucial differences between paper and online displays. For example, compared with the printed page, a screen display is typically smaller, and its resolution is usually inferior. To accommodate these differences, writers must present information more succinctly and concisely in online documents. Another important difference between paper and online documents is how these media are used. In most cases, paper documents are read from beginning to end, whereas online documents are read nonlinearly, with users jumping from topic to topic. Users of online documents typically chart a reading path that is personal and unpredictable. To be responsive to this trend, writers of online documents should craft information modules that are self-contained and introduce topics that can be clearly understood without the need for additional information.

Brevity. Writers have always been encouraged to write clear, succinct paper documents. This requirement is even more important for online documents because screen space is limited. The screen display is not only smaller than a printed page, but must also share this space with the application it was developed to support. Not surprisingly, the techniques for writing clear, succinct paper and online documents are identical:

- Use short, simple words familiar to the user.
- Write grammatically simple, direct sentences using the active voice.
- Use tables, charts, or graphics to convey information.
- Cross-reference important, related information by linking it to a separate display, rather than including all information in a single display.

Consistency. Within a document, electronic access to information depends heavily on the consistent use of terms. For example, the terms "online documentation" and "electronic documentation" can be used interchangeably within a document. To some, this variation might make the reading experience more pleasing. However, in a full-text search of "online documentation," the retrieval software would locate only the term entered, missing its synonym. In these cases, either the user or

Table II. Diversity in AT&T Online Products

Feature	IDS Windows	Frame Relay
Access to table of contents	**VIEW** key	**TOPICS** key
Access to search procedure	**SEARCH** key	**FIND** key
Access to help	Help	**F1**
Moving forward within a section	Up elevator icon	**NEXT PG** key
Moving backward within a section	Down elevator icon	**BACK PG** key
Moving forward one section	**NEXT** key	User chooses hypertext link
Moving backward one section	**PREVIOUS** key	Not available
History	Not available	**BACK UP (PREVIOUS ARTICLE)** key
Exit document	**VIEW** then **EXIT**	**QUIT** or **F10**

the writer must be able to identify likely alternatives to ensure the success of the searching process. Inconsistent terms can also confuse the user.

Modularity. No writer of online documents can predict all the reading sequences that might take a user to a particular topic. Writers must design each topic to be self-contained and easily understood, regardless of its context. Horton suggests that writers should create modular topics that answer one question about one subject for one purpose.[4] These modules, or chunks of information, answer one question fully or direct the user to other modules. These information modules should:

- Include a meaningful title that can be used to assess the relevance of the module's content[14]
- Include a topic sentence that introduces the subject, puts it in context, and helps the user determine if the module is relevant to his or her information needs[15]
- Briefly summarize the topic, using helpful checklists and/or tables.[16]

AT&T Online Documentation Standards

The AT&T Documentation Architecture group has formed a team to develop standards and guidelines for online documentation that accompanies AT&T products and services. This team includes representatives from business units, human factors organizations, and writing organizations. The guidelines they are developing should foster consistency across the various sources of online user information, including reference manuals and user guides, help systems, and quick reference aids. These standards will:

- Improve both the usability and the accessibility of all online documentation that accompanies AT&T products and services
- Ensure that all AT&T online documentation products provide a visual presentation — and user interface design — that is functional, useful, and consistent across products
- Make online documentation an integral part of the product development phases, including system design, user interface design, and others, as appropriate
- Establish standards and guidelines that contribute to cost efficiency and recognize the development factors, such as ease of use and a single file for all output media.

Table II illustrates the diversity of AT&T's online documentation products. This diversity can create some confusion among users of different AT&T online documentation products. It also highlights the need for corporate-wide standards to ensure that a consistent set of features for online documents is implemented in a way that is easy to use.

To develop these standards and guidelines efficiently, the online standards team has established four separate working groups. The two groups responsible for developing online standards are the:

- User interface and format standards group — Develops standards associated with text screen design, text format, and access and navigation strategies, such as paging, searching, history paths, and displays of tables of contents.
- Content and legal standards group — Develops guidelines for writing effective online documents and for legal issues associated with online documents.

Two additional groups ensure that decisions made by standards development teams are well-

motivated and justifiable:

- User input group — Gathers information and recommendations provided by users of online documentation products.
- Product assessment group — Reviews online documentation products to identify features or functions that might be incorporated into AT&T standards.

Future Challenges

Our experience with online documentation is just beginning. We face numerous challenges in developing online documents that are easy to use. One challenge is to make online documents as legible and readable as paper documents. We must identify which font styles, font sizes, and screen formats promote document legibility and enhance the readability of displayed text. We must also refine user interfaces of online documents to make functions such as setting bookmarks or writing notes as easy to use as they are in paper documents. Another challenge is to design user interfaces that are consistent with popular graphical user interface styles, including Microsoft Windows, Motif, and Open Look. (Motif is a trademark of the Open Software Foundation, Inc., and Open Look is a registered trademark of UNIX System Laboratories, Inc.)

In addition, writers must learn appropriate techniques for writing online documents. This is especially crucial for writers of hypertext documents, who, like system programmers, must design modules of information that often have multiple entry and exit points.

Finally, we must establish corporate-wide online standards to identify a core set of format and navigational features that are easy to use and can be implemented consistently in all of AT&T's online products.

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